



Northeast Regional Challenges to Modern Grid Implementation

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One Regional Issue

- Goal of session:
 - specific regional issues that must be addressed if the Northeast is to modernize its grid
- One issue:
 - integration of distributed energy resources



Massachusetts DG Collaborative

- Proceeding: D.T.E. 02-38, Massachusetts Department of Telecommunications And Energy (DTE), began in 2002
- Topics assigned to DG Collaborative:
 - Uniform Interconnection Tariff (effective 4/04)
 - Technical approach to interconnection on spot and area networks
 - Role of DG in Distribution Company Planning:
 - » Distribution Planning Working Group
 - » Economic Analysis by Navigant Consulting (selected slides included below; see whole presentation on website)
 - » 3 technical challenges, potential solutions
 - » Next step: Charrette to integrate technical & economic solutions
 - » Coordination with other projects (MTC, EPRI)



See: <http://masstech.org/dg/Benefits.htm>



Distributed Generation and Distribution Planning: *An Economic Analysis for the Massachusetts DG Collaborative*

January 20, 2006

Prepared by Navigant Consulting, Inc.
under contract to the
Massachusetts Technology Collaborative



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The most attractive ownership option varies by the characteristics of the planning opportunity.

Deferral Periods		
Opportunity	Active Utility Scenario	Active Customer Scenario (3 yr)
NGRID Norwell	1 yr	1 yr
NGRID Worcester	0 yr	0 yr
FG&E Lunenberg	2 yr	2 yr
FG&E Leominster	10 yr	N/A
NSTAR Woburn	1 yr	0 yr
NSTAR Framingham	0 yr	9+ yr
WMECO Substation	6 yr	3 yr
WMECO Circuit	2 yr	2 yr

Key Drivers for DG/Distribution Planning Attractiveness

- **Cost of Upgrade versus Shortfall** is a key driver. Opportunities that require large investments for a relatively small shortfall tend to be more attractive. This is a bigger driver for the Active Utility scenario. It is less of an impact for the Customer scenarios, even though it drives the size of the incentive.
- **Customer Characteristics** are important for the Customer scenarios. The better opportunities (i.e. with lower weighted average paybacks) have large C&I customers with good thermal demand and access to natural gas.
- **Shortfall as a Percentage of Load** is important for the Customer scenarios. The more customer load and smaller the shortfall the more opportunities there are for DG to meet the capacity needs. Opportunities with a small shortfall as a percentage of load tend to have a greater probability that customer resources can offset the shortfall.
- **Timing for the Upgrade** is an important driver for the Customer Case. The NGIRD Worcester and NSTAR Woburn opportunities start with a capacity shortfall in 2006. This makes it difficult for DG to ramp up to meet the shortfall. In the Active Utility scenario, DG may be installed more quickly.
- **Load Growth** is an important driver for both cases. Opportunities with slower load growth tend to be more attractive.



DER for Distribution: 3 Conditions

- Enough DER capacity to meet distribution planning needs
 - process of marketing, enrolling, assessing customer suitability and viability for deploying DER is a complex and time consuming process, and needs substantial further study.
- DER reliability to meet distribution planning needs
 - A DER solution must result in the same level of reliability that a distribution system upgrade provides.
 - A more comprehensive evaluation of the design requirements of DG installations necessary to support distribution system reliability will be needed.
- The economics of the DER solution favorable for all
 - Win-Win financial arrangements needed, for utility as well as customers and society.



DER for Distribution: 3 Challenges



	Type of Deficiency	Type of Impact	Summary of Challenge	Potential Solutions
1	DER Monitoring and Control	Normal Load Deficiency	Resource availability during heavy load conditions	
		Contingency Based Deficiency	Dispatchability of DG resource in response to contingency	
2	DG Response During Disturbances	Normal Load Deficiency	DG response to recloser operation	
		Contingency Based Deficiency	DG availability following a contingency	
3	Protection System Changes	Normal Load Deficiency	Relay coordination issues	
		Contingency Based Deficiency	Reverse power flow issues	



DER for Distribution: 3 Challenges

- **DER Monitoring and Control**
 - how DG units would be operated as integral components of a utility distribution system, in addition to elements of customer energy management solutions.
- **DG Behavior on Distribution Systems**
 - how widespread applications of DG on distribution systems will behave.
 - how resilient these DG units will be to remain in operation during disturbances on other portions of the distribution system (not necessarily involving a fault on the circuit they are connected to).
- **Utility System Design Changes**
 - existing utility primary-voltage distribution circuits and their protection systems are largely designed to be operated radially out from a single electrical source. They are not typically designed to function with multiple electrical sources out beyond the substation supply. Their layout and protection devices are configured to optimize their performance for power flow from only one direction.
 - The fundamental requirement would be to integrate DG units into the designed reliability of the system, which could require additional system upgrades and modifications.



Nine Potential Components of a Win-Win Framework

Incentives to DER Host Customers:

- Customer-Specific Distributed Resource Contracts
- Targetted Distributed Resource Credits
- Transitional Distributed Resource Credits

Rate Redesign:

- Real-Time Pricing
- Redesign of Demand, Energy and Fixed Rate Components

Treatment of Utilities and Nonparticipating Ratepayers:

- Tracking/Balancing Accounts
- Shared Savings or Other Targeted Incentives
- Revenue-based PBR
- Adding DER Costs to Rate Base



EPRI DER Public/Private Partnership

- Phase 2 of multi-state project: 2006 - 2007
- Goal: create incentives for electricity providers to proactively integrate DER.
- For further information:
 - see the proposal entitled “Creating and Demonstrating Incentives for Electricity Providers to Integrate Distributed Energy Resources (DER),” recently submitted by Massachusetts DOER to the State Technologies Advancement Collaborative (STAC).
 - contact EPRI or DOER for information on participation.
- Pilot projects in CA and MA, including:
 - Congestion Relief Pilot: MTC and National Grid (see below)



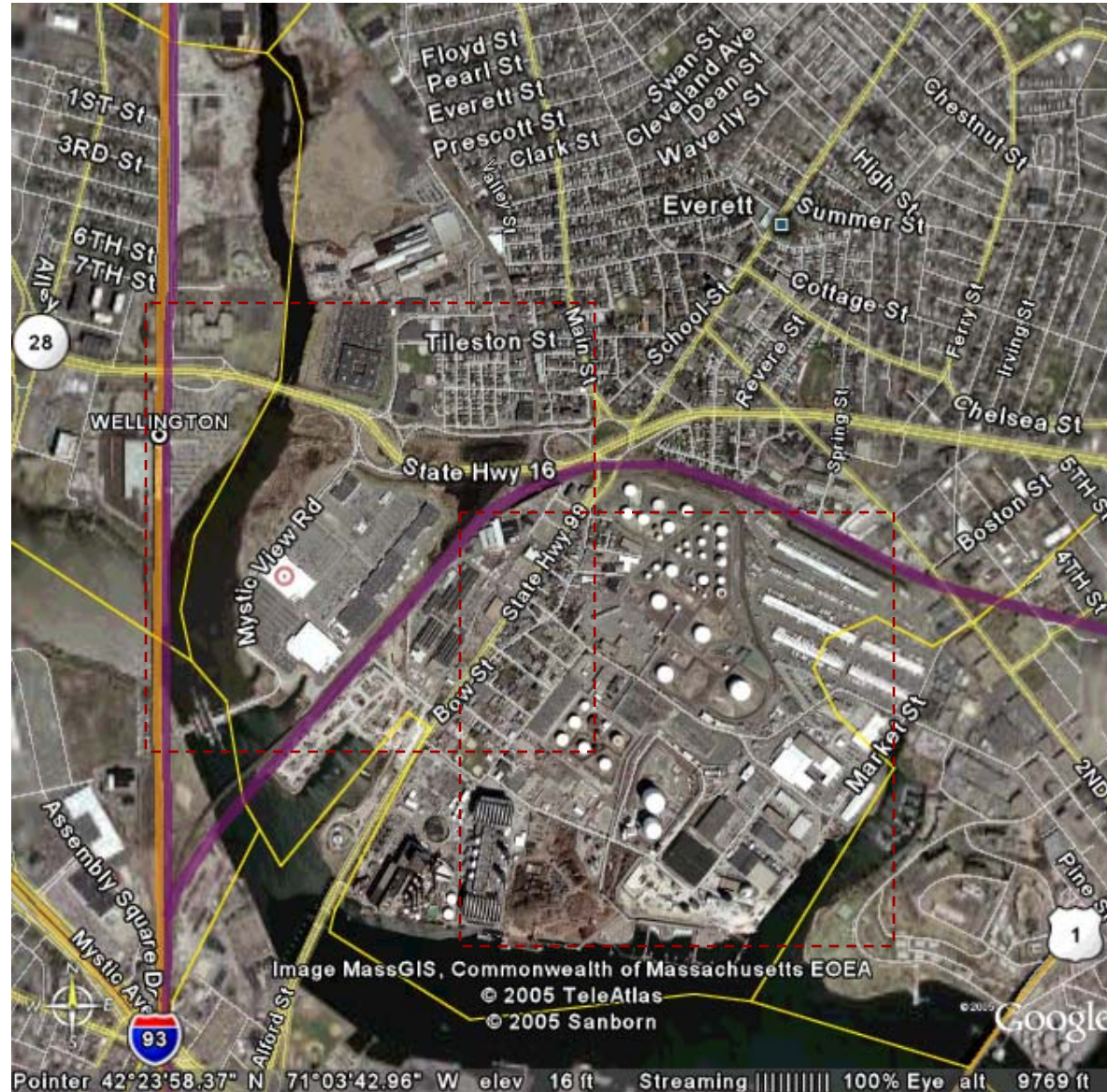
MTC Congestion Relief Pilots

- Partnership:
 - Renewable Energy Trust of the MTC
 - National Grid & other interested distribution companies
- DE Installations:
 - renewable DG and other distributed energy resources
 - demand-response & energy efficiency,
 - storage & other distributed resources
 - collect data on all benefits and costs from such DE (T&D, markets)
- Win/Win Strategies
 - Enhanced “Smart DE” – joint optimization in design and dispatch
 - Modes of Operation
 - Business Models – and potentially rate recommendations



Outside Boston







DG Collaborative report to state regulators

Please visit our website for the 2006 Report, which will be submitted to the DTE on June 30, 2006:

<http://masstech.org/dg/collab-reports.htm>



Some topics for discussion ...

- characteristics of the grid and electricity markets in the Northeast that distinguish the Northeast from other regions
- specific regional issues that must be addressed if the Northeast is to modernize its grid
- particular issues you deal with or would deal with in modernizing the grid, based on the stakeholder perspective you represent